

## AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 03/01679  
filed on May 23, 2003.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention is **directed to an improved** ~~based on a~~ fuel injection valve for internal combustion engines, ~~as generically defined by the preamble to claim 1. A fuel injection valve this kind is described, for example, in the patent application DE 100 31 265 A1 and has a valve body that contains a bore. At its end oriented toward the combustion chamber, the bore is delimited by a valve seat that has at least one injection opening leading from it, which feeds into the combustion chamber of the engine in the installed position of the fuel injection valve. The bore contains a piston-shaped valve needle in a longitudinally sliding fashion, which has a valve sealing surface at its combustion chamber end, i.e. the end oriented toward the valve seat, and this valve sealing surface of the valve needle cooperates with the valve seat. In the closed position of the valve needle, i.e. when the valve needle is resting with its valve sealing surface against the valve seat, the injection openings are closed, whereas when the valve needle is lifted away from the valve seat, fuel flows between the valve sealing surface and the valve seat, through the injection openings, and from there, is injected into the combustion chamber of the engine.~~

Please add the following new paragraph after paragraph [0002]:

[0002.2] Description of the Prior Art

Please add the following new paragraph after paragraph [0002.2]:

[0002.4] A fuel injection valve of the type with which this invention is concerned is described, for example, in the patent application DE 100 31 265 A1 and has a valve body that contains a bore delimited its end oriented toward the combustion chamber by a valve seat that has at least one injection opening leading from it, which feeds into the combustion chamber of the engine in the installed position of the fuel injection valve. The bore contains a piston-shaped valve needle in a longitudinally sliding fashion, which has a valve sealing surface at its combustion chamber end, i.e. the end oriented toward the valve seat, and this valve sealing surface of the valve needle cooperates with the valve seat. In the closed position of the valve needle, i.e. when the valve needle is resting with its valve sealing surface against the valve seat, the injection openings are closed, whereas when the valve needle is lifted away from the valve seat, fuel flows between the valve sealing surface and the valve seat, through the injection openings, and from there, is injected into the combustion chamber of the engine.

Page 2, please replace paragraph [0004] with the following amended paragraph:

[0004] ~~Advantages of the Invention~~

#### **SUMMARY AND ADVANTAGES OF THE INVENTION**

Please replace paragraph [0005] with the following amended paragraph:

[0005] The fuel injection valve according to the invention, ~~with the characterizing features of claim 1,~~ has the advantage over the prior art that without changing the geometry of the valve needle, a constant opening pressure can be maintained over the entire service life of the fuel

injection valve. To this end, the valve seat has two conical partial surfaces, the second conical partial surface downstream of the first conical partial surface. The second conical partial surface is raised in relation to the first conical partial surface so that in the closed position, the valve needle comes into contact with the second conical partial surface and the edge at the transition between the first conical partial surface and the second conical partial surface defines the hydraulically effective seat diameter.

Page 3, please replace paragraph [0006] with the following amended paragraph:

[0006] Advantageous modifications of the subject of the invention are **disclosed** ~~possible by means of the dependent claims.~~

Page 4, please replace paragraph [0011] with the following amended paragraph:

[0011] ~~Drawings~~      **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0012] with the following amended paragraph:

[0012] **The above and other features of the invention will become apparent from the detailed description contained herein below, taken in conjunction with the drawings, in which:** ~~Several exemplary embodiments of a fuel injection valve according to the invention are shown in the drawings.~~

Please replace paragraph [0017] with the following amended paragraph:

[0017]      **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

~~Description of the Exemplary Embodiments~~

Please replace paragraph [0018] with the following amended paragraph:

[0018] Fig. 1 shows a longitudinal section through a fuel injection valve according to the invention. A valve body 1 has a bore 3 in which a piston-shaped valve needle 5 is guided in a

longitudinally sliding fashion. The valve needle 5 is guided here in a sealed fashion with a guide section 15 oriented away from the combustion chamber in a guide section 23 of the bore 3. Starting from the guide section 15, the valve needle 5 tapers toward the combustion chamber, forming a pressure shoulder 13 and, at its combustion chamber end, transitions into an essentially conical valve sealing surface 7. Between the valve needle 5 and the wall of the bore 3, a pressure chamber 19 is formed, which widens out radially at the level of the pressure shoulder 13. This radial expansion of the pressure chamber 19 is fed by a supply bore ~~25~~ 24 that extends in the valve body 1 and can supply highly pressurized fuel to the pressure chamber 19. At its end oriented toward the combustion chamber, the bore 3 is delimited by a valve seat 9 that has at least one injection opening 11 extending from it, which feeds into the combustion chamber of an engine in the installed position of the fuel injection valve.

Page 6, please replace paragraph [0021] with the following amended paragraph:

[0021] With ideally fixed ratios, i.e. if neither the valve needle 5 nor the valve seat 9 were to be deformed, then the sealing ~~edge surface~~ 17 of the valve needle 5 would define the hydraulically effective seat diameter. The total area of the valve seat surface 7 upstream of the sealing edge 17, i.e. the first conical sealing surface 107 in this exemplary embodiment, would be acted on by the fuel pressure, thus determining the hydraulic opening pressure. But because the valve needle 5 hammers into the valve needle 9, over time, a flat contact develops between the valve sealing surface 7 and the valve seat 9, thus also changing the hydraulically effective seat diameter in a way that reduces the area subjected to pressure, which causes the opening pressure to increase. But the design of the raised second conical partial surface 209 on the valve seat 9 limits the increase of this hydraulic seat diameter to the first annular step 21 so that the opening pressure remains unchanged even over extended operation of the fuel

injection valve. The second annular step 22 embodied between the second conical partial surface 209 and the third conical partial surface 309 delimits the area against which the valve needle 5 rests at the end oriented toward the injection openings so that precisely defined hydraulic ratios prevail at the valve seat. Adhesive forces possibly occurring between the valve needle and valve seat thus remain constant.

Page 8, please add the following new paragraph after paragraph [0024]:

[0025] The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.